

Multi Application Smallsat Tri-band Radar

Completed Technology Project (2017 - 2020)



Project Introduction

MASTR (the Multi-Application Smallsat Tri-band Radar) is a SmallSat instrument concept capable of electronic scanning, Doppler velocity measurement, and polarimetry at Ku/Ka/W-band frequencies. These capabilities allow MASTR to work as a cloud and precipitation radar, an altimeter (targeting sea ice height and snow depth) or as a scatterometer (in a spinning platform configuration). Consequently, MASTR has the potential to support several of NASA's Earth science programs including Cloud and Radiation, Precipitation Measurement, Cryospheric Sciences, Climate Variability and Change, and Physical Oceanography. We propose to demonstrate AirMASTR, an airborne prototype of MASTR. The architecture uses Active Linear Array Feeds (ALAFs) made out of tiles to feed a parabolic-cylindrical reflector in the RF front end. The back end uses a baseband digital system with direct up/down conversion for a simplified instrument architecture. A modular design allows MASTR to grow in size without the need for significant redesign. MASTR was conceived to enable significantly smaller instruments that meet several science needs using a modularized architecture that is flexible and can adapt to multiple measurement objectives. The proposed work will be divided into the following major tasks: 1) Design and Manufacture the Scanning Array Tiles (SATs) at Ku and Ka band; 2) Integrate the SATs to form the Active Linear Array Feeds (ALAF's) that will include the new Ku and Ka band feeds with the existing W-band feed; 3) Develop the digital system and the frequency converters; 4) Integrate and Test AirMASTR with a 30x50 cm reflector; and 5) Complete a set of engineering flights aboard NASA's DC-8 aircraft. The entry TRL for AirMASTR will be 3, while the exit TRL will be 7 upon completion of the engineering flights. At that point MASTR can be considered to have TRL 5.



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

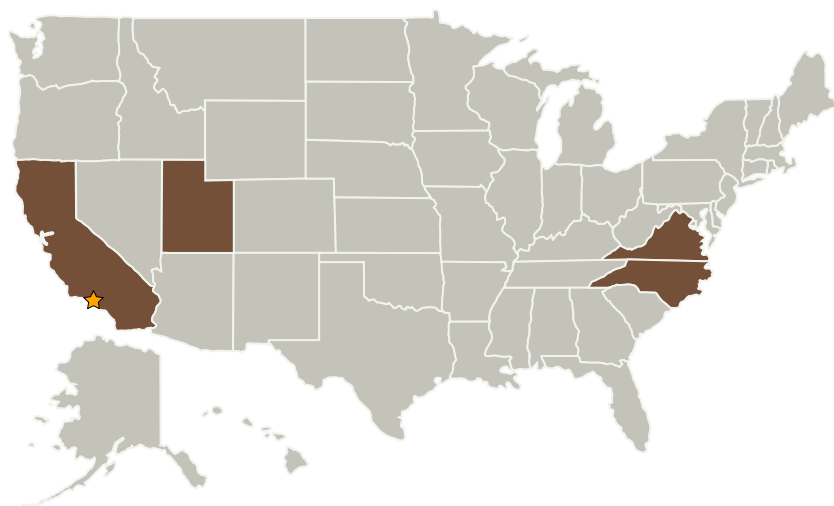
Instrument Incubator

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Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|-----------------------------------|-------------------|-------------|----------------------|
| ★ Jet Propulsion Laboratory (JPL) | Lead Organization | NASA Center | Pasadena, California |

| Primary U.S. Work Locations | |
|-----------------------------|----------------|
| California | North Carolina |
| Utah | Virginia |

Project Management

Program Director:

Pamela S Millar

Program Manager:

Parminder S Ghuman

Principal Investigator:

Mauricio Sanchez-barbety

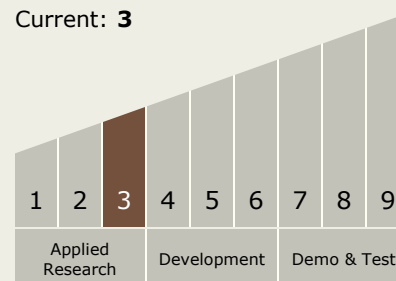
Co-Investigators:

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Andrew Brown
Simone Tanelli
Benjamin Cannon
Ziad S Haddad
Karen R Piggee
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Technology Maturity (TRL)

Start: 3

Current: 3



Technology Areas

Primary:*Continued on following page.*

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Technology Areas (cont.)

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destination

Earth